
A TAXONOMIC REVISION OF *DICOMA* (ASTERACEAE: CICHORIOIDEAE: MUTISIEAE) FOR THE HORN OF AFRICA¹

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ABSTRACT

A revision of the genus *Dicoma* (Asteraceae: Cichorioideae: Mutisieae) in the Horn of Africa (Djibouti, Eritrea, Ethiopia, and Somalia) is provided. This area is probably a major center of radiation for this genus, and nine of the twelve species present are endemic here. The revision is based on both field observations and micro- and macromorphological study of herbarium specimens. Six of the twelve species recognized have been described recently by the first two authors. For each species, data are presented on morphological characteristics, area of distribution (of particular interest in view of the incorrect information previously published for several of the species), ecology, and local names. One new species, *D. thuliniana*, is described and illustrated, one new combination, *D. schimper* subsp. *cinerea*, is proposed, and *D. lanuginosa* is lectotypified.

The genus *Dicoma* Cass. (Asteraceae: Cichorioideae: Mutisieae) consists of about 50 species of herbs, shrubs, and small trees. Most species are from tropical and southern Africa and Madagascar, though one species reaches the Arabian Peninsula and India and Pakistan.

Traditionally, *Dicoma* has been included in the tribe Mutisieae (Jeffrey, 1967; Cabrera, 1977). Recently, Hansen (1991) has suggested its exclusion from this tribe, largely because (a) the surface morphology of the corolla cells does not show the typical Mutisieae pattern, (b) the corolla is clearly divided into a narrow tube and a broad limb, and (c) in species with bilabiate flowers the upper lobes are absent or short and uncoiled. However, recent cladistic analyses of the subfamily Cichorioideae have suggested that *Dicoma* should be included in the Mutisieae despite these differences (Karis et al., 1992; Bremer, 1994).

The Horn of Africa (Djibouti, Eritrea, Ethiopia, and Somalia), which is probably a major center of radiation for *Dicoma*, is one of the least known areas of the continent floristically (cf. Hedberg & Edwards, 1989; Thulin, 1993; Edwards et al., 1995). Until recently, only four species of *Dicoma* were known from this area; Cufodontis (1967) cited five species, but these included *D. gnaphaloides*, which is merely a synonym of *D. tomentosa*. More recent

work, and particularly study of herbarium material collected from the 1970s onward (especially in ETH, K, and UPS), has revealed the presence of twelve species, most of which have not been described previously (Ortiz & Rodríguez-Oubiña, 1994, 1995, 1996a, b; Rodríguez-Oubiña & Ortiz, 1995). We have also recently typified *D. bangueolensis* (Ortiz & Rodríguez-Oubiña, 1996a), thus resolving the nomenclatural problems and confusion arising from the erroneous reports of Buscalioni and Muschler (1913): as a result of this confusion, all the herbarium material of this species examined by us had been previously identified incorrectly or unidentified, despite this being one of the commonest species in Somalia.

It is also necessary to clear up a confusion deriving from Cufodontis (1967), who stated that *D. bangueolensis*, *D. somalensis*, and *D. schimper* extended into Ethiopia, when in fact these species are known only from Somalia.

In response to these recent developments, we here present a revision of *Dicoma* for the Horn of Africa, accounting for all the species previously known together with those described recently.

MATERIAL AND METHODS

A total of 120 herbarium specimens from BM, ETH, FT, G, K, OXF, P, PAL, PI, S, UPS, and W,

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Table 1. Composition of the sections of *Dicoma* proposed by Hoffmann (1893) (considering only those species present in the Horn of Africa).

sect. <i>Eudicoma</i>	sect. <i>Hochstetteria</i>	sect. <i>Psilocoma</i>	sect. <i>Pterocoma</i>
<i>D. bangueolensis</i>	<i>D. schimperi</i>	<i>D. aethiopica</i>	<i>D. sessiliflora</i>
<i>D. tomentosa</i>		<i>D. gillettii</i>	
		<i>D. hindiana</i>	
		<i>D. paivae</i>	
		<i>D. popeana</i>	
		<i>D. scoparia</i>	
		<i>D. somalensis</i>	
		<i>D. thuliniana</i>	

collected in Eritrea, Ethiopia, and Somalia, were studied, and all type material was examined by the authors; it was not possible to obtain herbarium material on loan from EA and MOC. We saw no *Dicoma* collections from Djibouti, although we know of one literature reference for the presence of *D. schimperi* subsp. *schimperi* in that country (Audru et al., 1994). All material was studied with the aid of a light microscope. We also studied other micro-morphological and anatomical characters with a compound light microscope; for this part of the study, floral parts were first boiled in water and placed in Hoyer's solution (Anderson, 1954) for observation. Testa morphology was classified following Grau (1980), and epidermal cell surface, twin hairs, and superficial achene gland morphology following Karis et al. (1992). In the species descriptions, anther length includes the length of the apical appendage and the anther tails.

PHYLOGENY

Very little is known about the phylogenetic relationships of *Dicoma*. A cladistic analysis of the subfamily Cichorioideae indicated that *Dicoma* is closely related to *Pleiotaxis* and *Erythrocephalum* (Karis et al., 1992). This conclusion was supported by Bremer (1994), who assigned these three genera plus the African genera *Pasaccardoa*, *Achyrothalamus*, and *Gladiopappus* to the "*Dicoma* group," which he considered to be monophyletic.

We are currently performing the first cladistic analysis of *Dicoma* in which the species considered include not only members of *Dicoma* but also members of the other genera of the *Dicoma* group sensu Bremer. Our preliminary conclusions indicate that *Dicoma* is paraphyletic with respect to *Pasaccardoa*, and that *Pleiotaxis*, *Achyrothalamus*, and *Erythrocephalum* are sister to *Dicoma* plus *Pasaccardoa*. In general, the most primitive species of *Dicoma* appear to be those of southern Africa and Madagascar. Most of the species of the Horn of Af-

rica form part of more advanced lineages resulting from radiation into more arid regions. *Dicoma sessiliflora* appears to form part of a lineage that underwent secondary adaptation to shadier, wetter sites.

If we accept Hoffman's (1893) division of *Dicoma* into eight sections, the species of the Horn of Africa fall into four sections: *Eudicoma* DC. (*Dimorphae* F. C. Wilson), *Hochstetteria* (DC.) O. Hoffm., *Psilocoma* Harv. (*Barbellatae* F. C. Wilson), and *Pterocoma* DC. (*Plumosae* F. C. Wilson), as detailed in Table 1. However, Hoffman's division of the genus does not appear to be a good reflection of phylogeny. A more useful approach might be to consider all species present in the Horn of Africa, except *D. sessiliflora*, as members of a single group.

DIAGNOSTIC CHARACTERS

In what follows, we discuss the principal diagnostic characters used in the systematics of *Dicoma*, and, in particular, those relevant to the species of the Horn of Africa.

Habit. *Dicoma* includes annual and perennial herbs, shrubs, and (Madagascar only) small trees. Some species, such as *D. aethiopica*, are variable in habit, with some individuals being annual herbs and others biennial or perennial. Other species, such as *D. sessiliflora*, are rootstock perennials. Some shrub species form dense cushions.

Stem. Gross stem morphology is of little diagnostic value: stems range from scarcely to highly branched, and the branches range from straight to highly twisted. Stem pubescence (or lack thereof) is a more useful character, ranging from glabrous or glabrescent to very densely tomentose, with interlaced, long, flexuose, simple hairs. Stem color ranges from greenish or stramineous to whitish or grayish white, or in some cases purplish.

Leaves. Leaf arrangement is always alternate, and spacing ranges from well separated to subfasciculate. Leaf shape ranges from linear to subor-

bicular, and the leaves may or may not be conduplicate. The leaf margin is generally entire or slightly serrate, and is in some cases highly revolute. A pseudopetiole may or may not be present. The leaf apex ranges from acute to obtuse, with or without a spine or a mucro. Leaf pubescence and color are generally similar to those of the stem, and leaves may be concolorous or discolorous, depending on whether the pubescence of the lower surface is markedly denser than that of the upper surface.

Capitulum. The capitulum has a variable number of subtending leaves. The shape and size of the involucre, ranging from narrow cylindrical to broadly campanulate, is useful for diagnosis.

The number of phyllaries and phyllary rows is also important, and whether the inner phyllaries are longer or shorter than the adjacent outer phyllaries is of particular value. The phyllaries can be erect, patent, or squarrose. Reflexed phyllaries are an important diagnostic characteristic, particularly in section *Pterocoma*, but *Dicoma* rarely has phyllaries of this type in the Horn of Africa (only the outermost phyllaries in *D. schimperi*). Phyllary shape is variable, ranging from linear or linear-lanceolate to deltate, while the apex may be acuminate or aristate. The phyllaries may be scarious at the margins or over their entire surface. The presence or absence of a conspicuous midrib is important. Pubescence ranges from glabrous to densely tomentose, and is generally similar to that of the stem and leaves.

Florets. The number of florets, which is of course related to capitulum size, shows great variation among species. The corolla may be white, cream, yellowish, violet, or lilac. The corolla lobes are recurved apically in all except one species in the Horn of Africa, and the veins along the edge may be slender and submarginal, or thick and marginal. The epidermis of the corolla shows either an "intestine-like" surface (i.e., a rugose pattern of longitudinal bands) or is slightly transversely undulate-striate or smooth. The indument is made up of short or long, twin, glandular hairs (see Karis et al., 1992: 418, figs. 4I, H, respectively).

The sizes of the different parts of the stamens and the shape of the anther appendages are likewise variable, but of little diagnostic value; the presence or absence of antrorse hairs on the tail apex is, however, important.

The most useful characteristics of the style are (a) the extent of the area occupied by sweeping hairs (hairs that brush the pollen through the anther tube for pollination), and (b) whether or not the basal sweeping hairs are longer than the rest.

Fruit. The achenes have (5)–8–10 prominent

ribs, or are not conspicuously ribbed. The achene hairs are situated between the ribs or all around the achene; in the latter case, they have a conspicuous bulbous, glandular base. Most species have epidermal glands and superficial biserial glands, always located between the ribs.

The testa may be of two types: the *Dicoma* type, with the external layer of the testa prosenchymatic and strengthened with ribs; or the *Gochnatia* type, with the lateral and basal walls of the testa epidermis strengthened and u-shaped in cross section (Grau, 1980).

The pappus may be isomorphic or dimorphic. In the latter case, there is an inner row of scales in addition to the various outer rows of bristles. In species in which the pappus is isomorphic, it may comprise a single row of about 10 rigid flattened bristles or bristle-like scales (as in *D. schimperi*), or several rows of bristles that may be either barbellate or plumose. In general, the number of pappus rows and the length of the pappus bristles are important diagnostic characters.

TAXONOMIC TREATMENT

Only synonyms relevant to species occurring in the Horn of Africa are included. Likewise, the genus description includes only those species present in the Horn of Africa.

***Dicoma* Cass., Bull. Sci. Soc. Philom. Paris 1817: 12. 1817. TYPE: *Dicoma tomentosa* Cass.**

Hochstetteria DC., Prodr. 7: 287. 1838. TYPE: *Hochstetteria schimperi* DC.

Annual or perennial herbs and shrubs. Stem simple to branched, sericeous to lanate, the branches generally striate. Leaves alternate, often with a pseudopetiole, the margins entire to serrulate. Capitula obovate to campanulate, sessile or pedunculate, discoid and homogamous (or radiate and heterogamous outside the Horn of Africa), often with subtending leaves; phyllaries multiseriate, acuminate to aristate, coriaceous, sometimes with scarious margins. Receptacle alveolate; pits surrounded by a membrane, generally with an irregular margin; paleae absent. Corollas white, cream, yellowish, violet, or lilac, actinomorphic, deeply 5-lobed, with short-glandular or long-glandular twin hairs. Anthers with lanceolate, acute to acuminate apical appendages and long-tapering, retrorse-pilose tails. Style swollen at the base, the branches connivent, with obtuse apex and short, generally subapical, acute, sweeping hairs. Achenes obovoid to turbinate, with (5)–8–10 obscure to prominent ribs, often glutinous between

the ribs, with ascending hispid hairs inserted between the ribs or all around the achene, the basal hairs shorter and spreading; testa of the *Dicoma* or *Gochnatia* type. Pappus of barbellate to plu-

mose bristles arranged in several rows with or without one internal row of scales; in one species (*D. schimperii*) the pappus is only of scales arranged in one row.

KEY TO THE SPECIES OF *DICOMA* OCCURRING IN THE HORN OF AFRICA

- 1a. Pappus conspicuously dimorphic, with external capillary bristles and ca. 10 innermost scales.
 - 2a. Shrub; leaves broadly elliptic to suborbicular, not conduplicate; phyllaries with short (0.2–0.5 mm) acuminate apex; achenes 1.3–1.5(–2.5) mm long 2. *D. bangeolensis*
 - 2b. Annual herb; leaves linear-elliptic to linear-ob lanceolate, often conduplicate; phyllaries with long (1–7 mm), acuminate-aristate apex; achenes 1.6–3 mm long 12. *D. tomentosa*
- 1b. Pappus isomorphic, made up solely of bristles, those of the innermost series sometimes somewhat broader toward the base.
 - 3a. Pappus uniseriate, of ca. 10 rigid, flattened bristles 7. *D. schimperii*
 - 3b. Pappus multiseri ate, of more than 10 bristles.
 - 4a. Phyllaries without median vein, the innermost shorter than the adjacent series; pappus of plumose bristles 9. *D. sessiliflora*
 - 4b. Phyllaries with a conspicuous median vein, the innermost longer than the other series; pappus of barbellate bristles.
 - 5a. Phyllaries squarrose.
 - 6a. Phyllaries 35–70 per capitulum, pubescent; corolla ca. 5 mm long; achenes 2.7–3 mm long, narrowly turbinate; pappus of 60–70 bristles, 4.5–5.2 mm long 4. *D. hindiana*
 - 6b. Phyllaries 100–140 per capitulum, glabrous; corolla ca. 9 mm long; achenes 1.5–2 mm long, broadly turbinate; pappus of 100–130 bristles, 7–9 mm long 10. *D. somalensis*
 - 5b. Phyllaries not squarrose.
 - 7a. Leaves linear-revolute, often with an apical spine.
 - 8a. Branches twisted, forming dense whitish cushions; leaves often subfasciculate, 7–17 mm long, slightly curved; capitula sessile to subsessile, apex of the phyllaries acuminate, 0.2–1 mm long; pappus 3–5 mm long 5. *D. pairae*
 - 8b. Branches erect, straight; leaves solitary, (5–)15–22(–26) mm long, straight; capitula on leafy peduncles, apex of the phyllaries acuminate, 1.2–3.5 mm long; pappus 6–7 mm long 11. *D. thuliniana*
 - 7b. Leaves linear-elliptic to elliptic, oblanceolate or spatulate, with flat margins, without an apical spine.
 - 9a. Annual or perennial herb; achenes 1.5–2.5 mm long; pappus 4–6 mm long.
 - 10a. Leaves 15–90 × 2–17 mm; involucre 7–11 × 12–20 mm; corolla (5–)6.5–8.2 mm long; pappus of 40–100 bristles arranged in 3(–4) rows 1. *D. aethiopica*
 - 10b. Leaves 15–25 × 2–3 mm; involucre 6–7 × 7–10 mm; corolla (4–)5 mm long; pappus of 25–40 bristles arranged in 1–2(–3) rows 6. *D. popeana*
 - 9b. Shrub; achenes 2.8–3.7 mm long; pappus 6.5–7(–8) mm long.
 - 11a. Leaves narrowly elliptic, 10–130 × 2–12.5 mm; involucre 13–15 × 22–23 mm, broadly campanulate; pappus of 100–120 bristles 3. *D. gillettii*
 - 11b. Leaves squamiform, to 3 × 1 mm; involucre 6.5–8 × 3.8–5.5 mm, narrowly cylindric; pappus of 65–75 bristles 8. *D. scoparia*

1. *Dicoma aethiopica* S. Ortiz & Rodr. Oubifia, Nordic J. Bot. 16: 279. 1996. TYPE: Ethiopia. Bale; at the Sof Omar Caves, 6°55'N, 40°50'E, ca. 1400 m, 31 Oct. 1985, Friis, Gilbert & Vollesen 3686 (holotype, K; isotype, ETH).

Annual or perennial herb to 40 cm high. Taproot slightly ramified. Stem ramified; the branches striate, greenish to purple, moderately grayish white-tomentose, with simple hairs and sessile to subsessile glands. Leaves 15–90 × 2–17 mm, linear-elliptic to oblanceolate, attenuate at base on a decurrent pseudopetiole 2–20 mm long; the margins serrulate, slightly callose; apex acute; both surfaces

greenish to purple, rugose, slightly to moderately tomentose, with sessile glands in some cases on the upper surface slightly darker and slightly more glabrescent. Capitula numerous per plant, on erect-patent peduncles, 30–90 mm long, with 3–5(–8) subtending leaves; involucre 7–11 × 12–20 mm, campanulate, with 70–100 phyllaries arranged in 4–5(–6) rows, stramineous to purple, with a darker stripe on either side of the midrib, acuminate, pungent, glabrous to glabrescent, the margins entire to shortly serrulate principally toward the apical part; not scarious or with very narrow scarious margins; outermost phyllaries 3.5–4.5 × 0.7–0.8 mm, ovate-lanceolate, erect-patent, with an acuminate apex

1.5–2 mm long; middle phyllaries 6–8 $\times$ 1.2–1.5 mm, lanceolate, erect-patent, with an acuminate apex (3–)4–5 mm long; innermost phyllaries 9–11 $\times$ 1.5–1.7 mm, longer than the outer phyllaries and projected ca. 2 mm beyond the pappus or shorter than the pappus, oblong-lanceolate, erect, with an acuminate apex 1.2–3 mm long; receptacle concave, alveolate, pits surrounded by a membrane with an irregular dentate margin 1–1.3 mm high. Florets 15–25 per capitulum. Corolla (5–)6.5–8.2 $\times$ 1.8–3 mm, white, with epidermal cell surface “intestine-like” and with short glandular twin hairs; tube 2.8–4.8 $\times$ 0.4–0.9 mm; lobes 3.3–3.5 $\times$ 0.4–0.5 mm, becoming recurved, with slender submarginal veins. Stamens exserted for 0–2.5 mm beyond the corolla; filaments 1.3–2 mm long; collar 0.4–0.5 mm long; anthers 3.9–4.1 mm long; apical appendages ca. 1 mm long, conspicuously apiculate; anther tails 1.2–1.3 mm long, with retrorse hairs 0.2–0.4 mm long and some shorter antrorse hairs at the apex. Style 6.5–9 mm long, stylar branches 2.3 mm long, with sweeping hairs forming a sub-apical ring, covering a surface 0.4 mm long, the basal ones longer than the others. Achenes 1.5–2.5 $\times$ 0.7–1.2 mm, turbinate, 10-ribbed, hispid, with ascending hairs 0.2–2.5 mm long, inserted between the ribs from the base to the top of the achene, with epidermal glands and superficial biseriate glands between the ribs; testa of *Dicoma* type; pappus isomorphic, of 40–80(–100) barbellate bristles arranged in 3(4) series, the innermost bristles broadened toward base, the longest bristles 4–6 mm long, the shortest ca. 1 mm long; barbellae 0.1–0.2 mm long.

Habitat and distribution (Fig. 1). Known only from Ethiopia, at 1400–1500 m. Limestone or granitic outcrops; dense to open *Acacia-Commiphora* bushland and open areas with *Combretum molle*, *Terminalia brownii*, etc. Endemic.

Additional specimens examined. ETHIOPIA. **Bale:** 13 km from Ginir on road to Robi via Sof Omar, 7°5'N, 40°43'E, 1500 m, Gilbert, Ensermu & Vollesen 7870 (ETH, K, UPS). **Sidamo:** Bitata, 20 km from Negele on road to Kilbre Mengist, 5°29'N, 39°28'E, 1450 m, Gilbert, Ensermu & Vollesen 7781 (ETH, K, UPS).

The principal diagnostic characters of this species are its concolorous, generally rugose, elliptic to oblanceolate leaves with more or less long pseudopetioles, and the pappus of 40–100 barbellate bristles that are slightly broadened at the apex arranged in 3(–4) rows. In the Horn of Africa, the most closely related species is undoubtedly *D. popeana*, which has smaller leaves (15–25 $\times$ 2–3 mm), a smaller involucre (6–7 $\times$ 7–10 mm), and a

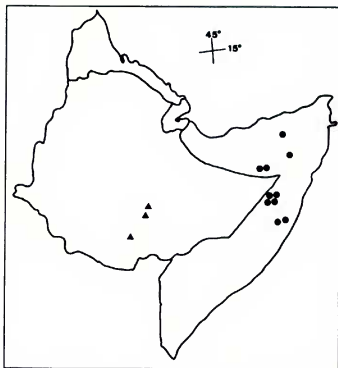


Figure 1. Distribution of *Dicoma aethiopica* (▲) and *D. bangeolensis* (●) in the Horn of Africa.

smaller corolla ((4–)5 mm long), as well as fewer pappus bristles (< 40) arranged in 1–2(–3) rows. In the genus as a whole, the most similar species morphologically is *D. anomala* Sond., one of the most widely distributed species of the genus. This species can be distinguished from *D. aethiopica* by its sessile or short-pseudopetiolate leaves, these discolorous with the lower surface densely tomentose, and by the 7–12-mm-long pappus made up of more than 100 bristles that are conspicuously narrower at the apex.

The color of dried *D. aethiopica* specimens shows great variability: some specimens (such as the holotype) are basically greenish to stramineous, while Gilbert, Ensermu & Vollesen 7781 (K) exhibits a strong purplish coloration of the stem, leaves, and phyllaries.

2. *Dicoma bangeolensis* Buscal. & Muschl., Bot. Jahrb. Syst. 49: 514. 1913. TYPE: Somalia. Between Hobyo and Wuarandi and in Merehan, Robecchi-Brigueti s.n. (lectotype, designated by Ortiz & Rodríguez-Oubiña (1996), K).

Dicoma somalensis O. Hoffm. ex Engl., Sitzungsber. Königl. Preuss. Akad. Wiss. 1904: 371. 1904, nom. illeg., non S. Moore, 1899. TYPE: Somalia (without precise locality or collector; see Ortiz & Rodríguez-Oubiña, 1996).

Vernacular names. Darran (Beckett 242), Ged-aad (Kazmi, Celmi, Mahmud & Sulaiman 5), Ghedhad, uadad (Cufodontis, 1967).

Shrub or shrublet to 60 cm high. Taproot slightly ramified. Stem often highly ramified; the branches nearly quadrangular in section, covered with a grayish white tomentum of simple hairs, especially on young branches, with sessile to subsessile glands. Leaves (6-)12-17(-23) $\times$ (3.5-)5-7(-10) mm, alternate, sometimes fasciculate, elliptic to broadly elliptic, sometimes suborbicular, with a pseudopetiole (1.5-)3-5(-8) mm long; the margins entire to denticulate; apex with a mucro up to 1 mm long; both surfaces with sessile glands, densely grayish white tomentose. Capitula numerous per plant, arranged in corymbiform synflorescences, on erect-patent peduncles 1-3(-9) mm long with linear bracts at the base, without subtending leaves; involucre 6-7(-9) $\times$ 4-6(-7) mm, obconic, with 20-30 phyllaries arranged in 4-5 rows, stramineous, with a darker stripe on either side of the midrib, acuminate, pungent, densely tomentose on the whole surface of the outer phyllaries and on the distal part of the median and innermost phyllaries, the margins shortly serrulate principally toward the apical part; outermost phyllaries 1-1.5(-2) $\times$ 0.5-0.7 mm, deltate, erect-patent, without acuminate apex, the margins not scarious; middle phyllaries 4-5 $\times$ 1-1.7 mm, deltate to oblong-lanceolate, erect, with an acuminate apex 0.2-0.3 mm long, the scarious margin 0.2-0.5 mm wide; innermost phyllaries 5-6 $\times$ 1.5-2(-2.5) mm, longer than outer phyllaries, projected 2-3(-4) mm less than the pappus, oblong-lanceolate, erect, with an acuminate apex 0.2-0.5 mm long, the scarious margin 0.3-0.8 mm wide; receptacle concave, alveolate, the pits surrounded by a membrane with a scarcely dentate margin 0.05-0.1 mm high. Florets 3-7 per capitulum, whitish pink. Corolla 7 $\times$ 1.5-1.7(-2) mm, purple or bluish, with epidermal cell surface "intestine-like" and glabrous or with short glandular twin hairs, especially toward the basal part; tube 2-3 $\times$ 0.4-0.6(-0.8) mm; lobes 4-4.5 $\times$ 0.4-0.5 mm, becoming recurved, with slender submarginal veins. Stamens exerted for 0.7-1.5 mm beyond the corolla; filament 1.5-2 mm long; collar 0.2-0.5 mm long; anthers 4-5 mm long; apical appendages ca. 1.3 mm long, conspicuously apiculate or not apiculate; anther tails 1.2-1.5 mm long, with retrorse hairs ca. 0.3 mm long and 3-5 antrorse hairs at the apex. Style 6-7.5 mm long, stylar branches 1.3-1.7 mm long, with sweeping hairs forming a subapical ring covering a surface 0.4-0.7 mm long, the basal ones conspicuously longer than the others. Achenes 1.3-1.5(-2.5) $\times$ 0.8-1.7(-2.5) mm, turbinate, (8-)10-ribbed, hispid, covered with ascending, white hairs 0.2-2.5 mm long, these inserted between the ribs from the base

to the top of the achene, with epidermal glands and superficial biseriate glands between the ribs; testa of *Dicoma* type; pappus dimorphic, of 110-130 barbellate bristles arranged in 2-3 external series, the longest bristles (5-)6.5-7.5 mm long, the shortest 1 mm long; barbellae ca. 0.05 mm long; ca. 10 scales arranged in a single internal series, these 5.5-6.5 $\times$ 0.5-0.8(-1) mm, barbellate toward the apex.

Habitat and distribution (Fig. 1). Known only from northeastern Somalia, at 130-1300 m. Principally on gypseous soils, but also on limestone soils, stony or not; in *Acacia-Commiphora* bushland. Endemic.

Additional specimens examined. SOMALIA. **Mudug:** 23 km E of Baxdo, 5°71'N, 47°26'E, 145 m, *Beckett* 242 (FT, K); 6 km NW of Gaalkacyo, 6°49'N, 47°22'E, 300 m, *Beckett* 397 (K); 23 km E of Baxdo on road to Hoby, 5°48'N, 47°28'E, 130 m, *Gillett, Hemming & Watson* 22381 (K); 8 km E of Bacaadweyn on road to Baardale, 7°09'N, 47°37'E, 360 m, *Gillett, Hemming & Watson* 22028 (K); 1 km from Gaalkacyo toward Garowe, *Kazmi, Celmi, Mahmud & Sulaiman* 5 (FT); 10 km from Gaalkacyo along road to Belet Uen, 300 m, *Thulin* 5635 (K, UPS); **Nugaal:** 1 mi. N of Laascaanood, 2400 ft., *Bally* B10873 (K); ca. 8 km NE of Xalin on road to Qardho, 9°05'N, 48°41'E, 675 m, *Gillett & Beckett* 23352 (K); 3 km E of Laascaanood, 8°25'N, 47°20'E, *Hansen & Heemstra* 6322 (K); **Sanaag:** 10°37'N, 48°11'E, 1300 m, *Gillett & Watson* 780 (K).

The principal distinguishing morphological characters of *Dicoma bangueolensis* are its concolorous densely grayish-tomentose, elliptic to broadly elliptic, sometimes suborbicular leaves, obconic involucre, and dimorphic pappus of 110-130 barbellate bristles in 2-3 rows with an inner row of 10 scales. In the Horn of Africa, *D. tomentosa* is the only other *Dicoma* species with a dimorphic pappus, of similar characteristics; however, this species is very different as regards habit, leaf morphology, and the size and morphology of its phyllaries and achenes. The only other *Dicoma* species with an obconic involucre is *D. dinteri* S. Moore (from Namibia); however, this species has linear leaves and an isomorphic pappus.

Wilson (1923) cited *D. bangueolensis* as a member of his section *Dimorphae*, characterized by a dimorphic pappus (though he stated that this species occurs in the Tanganyika region, as erroneously reported by Buscalioni & Müschler, 1913). Cufodontis (1967) reported this species from Somalia, probably on the basis of Volkens (1915), and also from Ethiopia, though we have yet to see a specimen from the latter country.

We have recently (Ortiz & Rodríguez-Oubiña, 1996a) resolved the nomenclatural problems and

confusion arising from the erroneous reports of Buscalioni and Muschler (1913). In fact, all specimens of *D. bangueolensis* seen by us in the course of our herbarium studies of *Dicoma* had been incorrectly identified or left unidentified.

3. *Dicoma gillettii* Rodr. Oubiña & S. Ortiz, Bot. J. Linn. Soc. 119: 59. 1995. TYPE: Somalia. Shabeellaha Dhexe: 30 km S of Aadan Yabaal, 3°27'N, 46°12'E, 170 m, 6 June 1981, *Gillett & Beckett* 23263 (holotype, K; isotype, UPS).

Shrub to 40 cm high, ramified; the branches striate, covered with a dense grayish white tomentum of simple hairs covered externally with a membranaceous pellicle, with sessile to subsessile glands. Leaves (10–)30–110(–130) × (2–)4–9(–12.5) mm, narrowly elliptic, attenuate at base and decurrent on a slightly stem-clasping pseudopetiole 7–25 mm long; the margins irregularly callose denticulate; apex acute; upper surface greenish, glabrous and covered with a membranaceous pellicle, with sessile glands; lower surface densely grayish white-tomentose, with sessile glands. Capitula several per plant, solitary on erect to erect-patent peduncles, 40–70 mm long, with 3–5 subtending leaves; involucre 13–15 × 22–23 mm, broadly campanulate, with 65–80 phyllaries arranged in 5–6 rows, stramineous, rigid, acuminate, pungent, scarcely tomentose to glabrescent, the margins shortly serrulate-fimbriate toward the basal part; outermost phyllaries 4–5 × 1.5–2 mm, ovate, widening sharply and becoming scarious in their basal third, patent to erect-patent, with an acuminate apex 3–5 mm long; middle phyllaries 10–12 × 2–2.5 mm, ovate-lanceolate, erect-patent, with an acuminate apex 2–3 mm long; innermost phyllaries 9–12 × 2–3 mm, longer than the outer phyllaries, as long as the pappus, lanceolate, erect to slightly patent, with an acuminate apex 0.5–1.5 mm long. Florets (25–)30–35 per capitulum. Corolla 9–12 × 1.2–2.5 mm, yellowish, with epidermal cell surface “intestine-like” and with short glandular twin hairs; tube 5–6 × 0.7–1.5 mm; lobes 5–6 × 0.4–0.7 mm, becoming recurved, with slender submarginal veins. Stamens exerted for 0.5–1 mm beyond the corolla; filaments 2–2.5 mm long; collar 0.5–0.7 mm long; anthers 5.8–6.5 mm long; apical appendages 1.5–2 mm long, conspicuously apiculate; anther tails 2.3–2.5 mm long, with retrorse hairs 0.3–0.5(–0.8) mm long and some shorter antrorse hairs at the apex. Style 9–11.5 mm long, stylar branches 2.5–2.7 mm long, with sweeping hairs forming a sub-apical ring, covering a surface 0.3–0.7 mm long, the basal ones conspicuously longer than the oth-

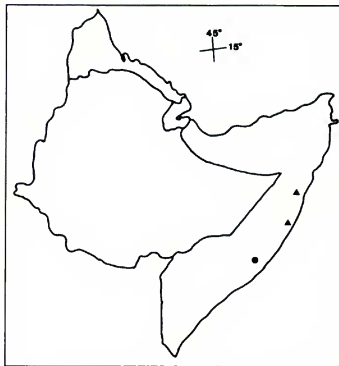


Figure 2. Distribution of *Dicoma gillettii* (●) and *D. hindiana* (▲) in the Horn of Africa.

ers. Achenes 2.8–3.1 × 1.7–1.9 mm, turbinate, 8- to 10-ribbed, hispid, with ascending hairs 0.3–2 mm long, these inserted between the ribs in the basal $\frac{3}{4}$ – $\frac{5}{8}$ of the achene, with epidermal glands and superficial biseriate glands between the ribs; testa of *Dicoma* type; pappus isomorphic, of 100–120 barbellate bristles arranged in 2–3(–4) series, the innermost bristles widening abruptly and becoming scarious in their basal third, the longest bristles 7(–8) mm long, the shortest 0.1–0.5 mm long; barbellae 0.1–0.2 mm long.

Habitat and distribution (Fig. 2). Known only from the type locality, at ca. 170 m. On yellowish level sand; *Acacia*–*Commiphora* bushland. Endemic.

The most important distinguishing characteristics of *Dicoma gillettii* are the presence of a membranaceous pellicle entirely covering the tomentum of the stem, and the broadly campanulate involucre with the outermost phyllaries widening abruptly and becoming scarious in their basal third. None of the other *Dicoma* species of the Horn of Africa exhibit a close morphological relationship with *D. gillettii*. Considering the genus as a whole, *D. anomala* Sond. is somewhat similar in leaf morphology and the shape and size of the involucre. However, *D. anomala* lacks a membranaceous pellicle covering the tomentum of the stem, and has considerably fewer phyllaries. Furthermore, the outermost phyllaries are deltate-lanceolate, without the widened, scarious, basal third that characterizes *D. gillettii*.

4. *Dicoma hindiana* S. Ortiz & Rodr. Oubiña ("hindana"), *Nordic J. Bot.* 15: 187. 1995. TYPE: Somalia. Mudug: near Hobyo, 14 Oct. 1912, *Drake-Brockmann 960* (holotype, K).

Shrub to 30 cm high. Taproot slightly ramified. Stem ramified; the branches striate, moderately grayish white-tomentose, with simple hairs, with sessile to subsessile glands, often with glabrescent to glabrous areas. Leaves (2-)8-18(-19) $\times$ (1.2-)2-5(-7) mm, elliptic to obovate, attenuate at base and decurrent on a pseudopetiole 0.5-4 mm long; the margins serrulate, often somewhat revolute; apex mucronate; upper surface greenish, tomentose, with sessile glands; lower surface generally densely grayish white-tomentose, with sessile glands. Capitula numerous per plant, 1-5 arranged in lax subcorymbose synflorescences, on erect-patent peduncles, 3-30 mm long, with 1-3(-4) subtending leaves; involucre 7-9 $\times$ 7-13 mm, campanulate, with (35-)45-60(-70) phyllaries arranged in (4-)5-7 rows, stramineous, with a darker stripe on either side of the midrib, acuminate-pungent, slightly tomentose, especially in the apical third, the margins entire to shortly serrulate-ciliate principally toward the apical part, not scarious; outermost phyllaries 1-1.5 $\times$ 0.5-0.7 mm, deltate to ovate, erect-patent; middle phyllaries 2.5-4 $\times$ 0.7-1 mm, lanceolate, squarrose, with an acuminate-aristate apex 0.2-0.6 mm long; innermost phyllaries 5.5-7(-8) $\times$ 0.7-1.1 mm, longer than the outer phyllaries and projected (0-)1.5-3(-4) mm beyond the pappus, lanceolate to oblong-lanceolate, squarrose, with an acuminate apex 0.5-1 mm long; receptacle concave, alveolate, the pits surrounded by a membrane with irregular denticulate margin 0.2-0.3 mm high. Florets 10-17 per capitulum. Corolla 5 $\times$ 1.6 mm, with epidermal cell surface "intestine-like" and with short glandular twin hairs; tube 1-1.5 $\times$ 0.6-1 mm; lobes 2.5-3 $\times$ 0.4 mm, becoming recurved, with slender submarginal veins. Stamens exerted for 1 mm beyond the corolla; filaments ca. 1 mm long; collar 0.4 mm long; anthers 3.2-4 mm long; apical appendages ca. 1 mm long, conspicuously apiculate; anther tails 1 mm long, with retrorse hairs 0.2-0.4 mm long and some shorter antrorse hairs at the apex. Style 4.8-5 mm long, stylar branches 1.3 mm long, with sweeping hairs forming a subapical ring, covering a surface 0.2-0.3 mm long, the basal ones conspicuously longer than the others. Achenes 2.7-3 $\times$ 0.8 mm, turbinate, 10-ribbed, hispid, with ascending hairs 0.3-1.5 mm long, these inserted between the ribs from the base to the top of the achene, with epidermal glands and superficial biseriate glands between the ribs; testa

of *Dicoma* type; pappus isomorphic, of 60-70 barbellate bristles arranged in 4-5 series, stramineous, the innermost bristles broadened toward the base, the longest bristles 4.5-5.2 mm long, the shortest 0.2-0.3 mm long; barbellae 0.05 mm long.

Distribution (Fig. 2). Known only from Mudug province in Somalia at ca. 90 m. Endemic.

Additional specimen examined. SOMALIA. Mudug: on road to Hobyo, 48 km S of Jirriiban, 90 m. *Gillet*, *Hemming & Watson 22104* (K).

The principal diagnostic characteristics of *Dicoma hindiana* are its squarrose phyllaries, narrowly turbinate achenes, and pappus of 60-70 barbellate bristles, these 4.5-5.2 mm long. The most morphologically similar species in the Horn of Africa is *D. somalensis*; indeed, all of the specimens of *D. hindiana* at K were labeled as *D. somalensis*. However, there are clear morphological differences between the two taxa. *Dicoma somalensis* has more phyllaries per capitulum ((100-)120-140); these are glabrous, and the innermost are erect. Furthermore, *D. somalensis* has a longer corolla (ca. 9 mm), shorter (1.5-2 mm), broadly turbinate achenes, and longer (7-9 mm) and more numerous (100-130) pappus bristles. Considering *Dicoma* as a whole, the only other species with consistently squarrose phyllaries as in *D. hindiana* and *D. somalensis* is *D. squarrosa* Wild, endemic to Angola (though some of the outermost phyllaries may be squarrose in some specimens of *D. anomala*). However, *D. squarrosa* can be clearly distinguished from *D. hindiana* by its elliptical leaves up to 50 mm long and its dimorphic pappus with both bristles and five broadly alate inner setae.

Note that we here use the epithet "hindiana," despite having originally described this species as "hindana"; this change is in accordance with the spelling recorded in *Index Kewensis* (Davies, 1996: 95).

5. *Dicoma paivae* S. Ortiz & Rodr. Oubiña, *Canad. J. Bot.* 72: 1478. 1994. TYPE: Somalia. Nugaal: about 80 km N of Eyl, 8°30'N, 50°7'E, 110 m, 11 June 1981, *Gillet & Watson 23375* (holotype, K).

Woody perennial, highly ramified; old branches very thick, twisted, forming cushions, young branches striate, covered with a whitish tomentum of simple hairs, old branches glabrous to glabrescent, without or with very scarce sessile to subsessile glands. Leaves sessile, subfasciculate, 7-17 $\times$ 0.7-1 mm, linear, slightly curved; leaf margins revolute, entire; apex with a short spine 0.5-0.8 mm

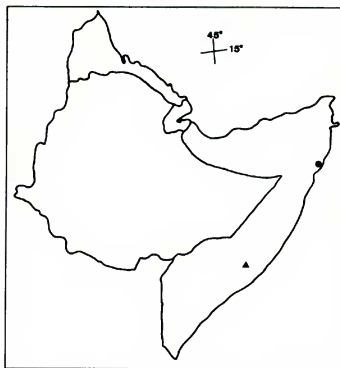


Figure 3. Distribution of *Dicoma paivae* (●) and *D. popeana* (▲) in the Horn of Africa.

long; both surfaces densely whitish-tomentose. Capitula numerous per plant, solitary, sessile or subsessile on up to 10-mm-long peduncles, with 1–3 subtending leaves; involucre 6–6.5 × 3–4 mm, obconic-campanulate, with 25–30 phyllaries arranged in 5–6 rows, stramineous, with a darker stripe on either side of the midrib, rigid, slightly acuminate, pungent, tomentose, the margins entire to shortly serrulate principally toward the apical part, not scarious or with a very narrow scarious border; outermost phyllaries 0.8–1 × 0.4–0.5 mm, deltate, patent to erect-patent, with an acuminate apex 0.2–0.3 mm long; middle phyllaries 3 × 1.3 mm, deltate-lanceolate, erect-patent, with an acuminate-aristate apex 0.5–0.7 mm long; innermost phyllaries 4–5 × 1.2–1.5 mm, longer than the outer phyllaries and shorter than the pappus, deltate-lanceolate, erect, with an acuminate-aristate apex 0.7–1 mm long. Florets unknown. Achenes 1.5–1.6 × 1–1.2 mm, turbinate, 8- to 10-ribbed, hispid, with ascending hairs 0.5–2 mm long, these inserted between the ribs from the base to near the top of the achene, with epidermal glands and superficial biserial glands between the ribs; testa of *Dicoma* type; pappus isomorphic, of 80–100 barbellate bristles arranged in 3–5 series, the innermost bristles broadened toward base, 0.1–0.5 mm wide, the longest bristles 3–5.5 mm long, the shortest 1–1.5 mm long, barbellae 0.05–0.1 mm long.

Habitat and distribution (Fig. 3). Known only from the type locality at ca. 110 m. Low gypseous limestone ridges, very stony and windswept; com-

mon with prostrate species of *Commiphora*, *Caesalpinia*, *Ochradenus*, *Acacia*, and cushions of *Oldenlandia saxifragoides*. Endemic.

The most important distinguishing characteristics of *Dicoma paivae* are its twisted branches forming dense white cushions, frequently subfasciculate, linear-revolute, slightly recurved leaves with an apical spine, and sessile or subsessile capitula. The most similar species in the Horn of Africa is *D. thuliniana*, which can be distinguished from *D. paivae* by its erect, straight branches, straight, solitary leaves longer ((5–)15–22(–26) mm) than those of *D. paivae*, long, leafy caputular peduncles, and longer pappus (6–7 mm). In the genus as a whole, *D. cana* Balf. f., from Socotra, shows some similarities to *D. paivae*, particularly in leaf morphology and general habit (it likewise forms dense, white cushions). However, the capitula of the former species are very different: all phyllaries lack a midrib, the outer phyllaries have a long, acuminate-aristate, patent apex, and the inner phyllaries are white and membranaceous-papery (Ortiz & Rodríguez-Oubiña, 1994).

6. *Dicoma popeana* S. Ortiz & Rodr. Oubiña, Nordic J. Bot. 16: 277. 1996. TYPE: Somalia. Hiiraan: 12 km from Ceel Baraf, 3°21'N, 45°49.5'E, 190 m, 14 Dec. 1987, Kuchar 17653 (holotype, K; isotype, UPS).

Vernacular name. Reexaan (Kuchar 17653).

Annual herb to 25 cm high. Taproot slender, slightly ramified. Stem highly ramified; the branches quadrangular in transverse section, moderately grayish white-tomentose, with simple hairs and sessile to subsessile glands. Leaves 15–25 × 2–3 mm, linear-elliptic, attenuate at base on a pseudopetiole 2–4(–5) mm long; the margins serrulate; apex with a mucro 0.2–0.5 mm long; both surfaces greenish, rugose, slightly to moderately tomentose, in some cases the upper surface slightly darker and slightly more glabrescent. Capitula numerous per plant, on erect-patent peduncles, 10–30 mm long, with 3–5 subtending leaves; involucre 6–7 × 7–10 mm, campanulate to broadly cylindrical, with 40–60 phyllaries arranged in 4–5 rows, stramineous, with a darker greenish to brownish stripe on either side of the midrib, acuminate, pungent, glabrescent to slightly tomentose, minutely strigulose, the margins entire to shortly serrulate toward the apical part; outermost phyllaries 2.5–4 × 0.4–0.7 mm, lanceolate, erect-patent, with an acuminate apex 0.7–2 mm long; middle phyllaries 6–7 × 1–1.3 mm, oblong-lanceolate, erect-patent, with an acuminate apex 1.5–2 mm long; innermost phyllaries 6.5–7.5

$\times 1\text{--}1.4$ mm, longer than the outer phyllaries and projected $0\text{--}1.5$ mm beyond the pappus, oblong-lanceolate, erect, with an acuminate-aristate apex $1\text{--}1.7\text{--}(2)$ mm long, and a scarious margin $0\text{--}0.4$ mm wide; receptacle concave to flat, alveolate, the pits surrounded by a membrane with a very irregular dentate margin $1.5\text{--}2$ mm high. Florets $8\text{--}12$ per capitulum. Corolla $(4\text{--})5 \times 1.2\text{--}1.5$ mm, yellowish, with epidermal cell surface "intestine-like" and with short glandular twin hairs; tube $2.2\text{--}2.5 \times 0.3\text{--}0.4$ mm; lobes $2.8\text{--}3.5 \times 0.4\text{--}0.5$ mm, becoming recurved, with slender submarginal veins. Stamens exerted for $0\text{--}1$ mm beyond the corolla; filaments $1\text{--}1.1$ mm long; collar $0.3\text{--}0.5$ mm long; anthers $3.3\text{--}3.6$ mm long; apical appendages ca. 1 mm long, not conspicuously apiculate; anther tails 1 mm long, with retrorse hairs 0.3 mm long and some shorter antrorse hairs at the apex. Style $4.6\text{--}6$ mm long, stylar branches $1.3\text{--}1.5$ mm long, with sweeping hairs forming a subapical ring, covering a surface $0.2\text{--}0.3$ mm long, the basal ones conspicuously longer than the others. Achenes $1.5\text{--}2 \times 1$ mm, turbinate, $10\text{--}ribbed$, hispid with ascending hairs $0.2\text{--}1.8\text{--}(2.5)$ mm long, these inserted between the ribs from the base to the top of the achene, with epidermal glands and superficial biseriate glands between the ribs; testa of *Dicoma* type; pappus isomorphic, of $25\text{--}40$ barbellate bristles arranged in $1\text{--}2\text{--}(3)$ series, the longest bristles $4\text{--}5$ mm long, the shortest ca. 1 mm long; barbellae $0.15\text{--}0.2$ mm long.

Habitat and distribution (Fig. 3). Known only from the type locality, at 190 m. In gently rolling orange sandhills; bushland with *Commiphora* cf. *velutina* and *Indigofera ruspolii*. Endemic.

The principal distinguishing characteristics of *Dicoma popeana* are its concolorous, generally rugose, linear-elliptic leaves with a more or less long pseudopetiole and a pappus of $25\text{--}40$ barbellate bristles, broadened slightly at the apex and arranged in $1\text{--}2\text{--}(3)$ rows. The most morphologically similar species in the Horn of Africa is *D. aethiopica*; in the latter species, however, the leaves ($15\text{--}90 \times 2\text{--}17$ mm), involucre ($7\text{--}11 \times 12\text{--}20$ mm), and corolla ($(5\text{--})6.5\text{--}8.2$ mm long) are all larger, and the pappus comprises $40\text{--}100$ bristles arranged in $3\text{--}(4)$ rows. Considering the genus as a whole, the most similar species is *D. anomala* Sond., which differs from *D. popeana* in the same ways as *D. aethiopica*.

7. *Dicoma schimper* (DC.) Baill. ex O. Hoffm., in Engl. & Prantl, Nat. Pflanzenfam. 4(5): 339. 1893. *Hochstetteria schimper* DC., Prodr. 7: 287. 1838. TYPE: Saudi Arabia. "In Montibus ad Vallem Fatmensem," *Schimper* 864 (holotype, G).

Annual herb to 45 cm high. Taproot slightly ramified. Stem scarcely to highly ramified; the branches striate, glabrous to densely grayish white-tomentose, tomentum of simple hairs, with sessile to subsessile glands. Leaves $(8\text{--})15\text{--}50 \times (2\text{--})5\text{--}16\text{--}(18)$ mm, elliptic-lanceolate to broadly ovate or suborbicular, with a pseudopetiole $(2\text{--})4\text{--}8\text{--}(15)$ mm long and auricles at the base; the margins serrulate, with teeth bulbous or not; apex with a $0.3\text{--}1 \times 0.2\text{--}1$ mm mucro; both surfaces green to grayish white, glabrous to densely tomentose, with sessile glands. Capitula numerous per plant, generally solitary or $2\text{--}12$ in lax corymbiform synflorescences, on erect-patent peduncles, $0.5\text{--}10$ cm long, with $1\text{--}4$ subtending leaves; involucre $(4\text{--})5\text{--}12\text{--}(13) \times (10\text{--})15\text{--}20\text{--}(23)$ mm, obconic-campanulate, with $40\text{--}70\text{--}(100)$ phyllaries arranged in $4\text{--}5\text{--}(6)$ rows, linear-deltate, stramineous to whitish colored, with a greenish stripe on either side of the midrib, rigid, with an acuminate apex $0.5\text{--}1$ mm long, pungent, glabrescent to densely tomentose, with broadly scarious margins $0.2\text{--}0.5$ mm wide, serrulate principally toward the apical part; the outermost phyllaries $2\text{--}5 \times 0.3\text{--}1$ mm, patent to reflexed, the margins not scarious; the middle phyllaries $(3\text{--})5\text{--}7\text{--}(9) \times 0.5\text{--}1\text{--}(1.3)$ mm, erect-patent; innermost phyllaries $8\text{--}11 \times 1\text{--}1.5$ mm, erect, longer than the outer phyllaries and projected $2\text{--}4$ mm beyond the pappus, all of the phyllaries becoming reflexed when the achenes are ripe; receptacle flat, alveolate, the pits surrounded by a membrane with a highly irregular dentate to fimbriate margin $0.2\text{--}0.3$ mm high. Florets $(10\text{--})20\text{--}40\text{--}(50)$ per capitulum. Corolla $5.5\text{--}9 \times 0.5\text{--}2\text{--}(2.5)$ mm, greenish yellow or greenish white to bluish, with epidermal cell surface "intestine-like" and with short glandular twin hairs; tube $2.6\text{--}5.5 \times 0.4\text{--}1$ mm; lobes $2.8\text{--}3.7 \times 0.5$ mm, becoming recurved, with thin slender submarginal veins. Stamens exerted for $0.5\text{--}1.5\text{--}(2.2)$ mm beyond the corolla; filament $0.8\text{--}2.5$ mm long; collar $0.4\text{--}0.5$ mm long; anthers $3.4\text{--}4.7$ mm long; apical appendages ca. $1\text{--}1.7$ mm long, apiculate; anther tails $1\text{--}1.3$ mm long, with retrorse hairs $0.3\text{--}0.5$ mm long and some shorter antrorse hairs at the apex. Style $5\text{--}8.3$ mm long, the branches $1\text{--}1.5$ mm long, with sweeping hairs forming a subapical ring, covering a surface $0.4\text{--}0.6$ mm long, the basal ones longer than the others. Achenes $1.5\text{--}2.5 \times 1\text{--}2.2$ mm, turbinate, $(8\text{--})10\text{--}(12)\text{--}ribbed$, hispid, with ascending hairs $0.3\text{--}2$ mm long, inserted between the ribs from the base to near the top of the achene, with epidermal glands and superficial biseriate glands between the ribs; testa of *Dicoma* type; pappus isomorphic, of $(4\text{--})8\text{--}10\text{--}(11)$ rigid, barbellate bristles, broadened toward base (or bristlelike

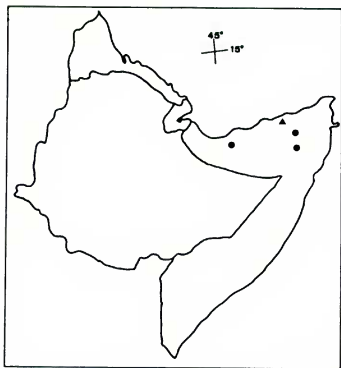


Figure 4. Distribution of *Dicoma schimperi* in the Horn of Africa: *D. schimperi* subsp. *schimperi* (●), *D. schimperi* subsp. *cinerea* (▲).

scales), arranged in one series, each bristle (4)5–7 × 0.2–0.5(0.6) mm.

The most characteristic feature of *Dicoma schimperi* is its pappus, comprising (4)8–10(–11) rigid, flattened bristles (or scales). Other characters worthy of note are its phyllaries, which become reflexed when the achenes are ripe, and the relatively narrow depressions between the ribs of the achenes. Most other characters show considerable intraspecific variation. No other species of *Dicoma* shows particular morphological similarities with *D. schimperi*.

Some authors, such as Cabrera (1977), have considered the above-mentioned characters, particularly those relating to pappus morphology, to be sufficient grounds for placing this taxon in a separate genus, namely the monotypic *Hochstetteria*. Nevertheless, more recent treatments (Hansen, 1991; Bremer, 1994) have maintained *Hochstetteria* as a synonym of *Dicoma*, in accordance with Hoffman (1893), who considered *Hochstetteria* as a section of *Dicoma*.

Cufodontis (1967) cited *D. schimperi* from Ethiopia, though we have not seen any specimens of this taxon from that country.

Habitat and distribution (Fig. 4). In the Horn of Africa, known only from Djibouti (Audru et al., 1994) and the north of Somalia at 714–2000 m. Principally in gypseous and limestone soils; in *Acaia-Commiphora* bushland. Djibouti, Egypt, Sudan, Somalia, and the Arabian Peninsula.

In our description of *Dicoma cinerea* (Ortiz & Rodríguez-Oubiña, 1994), we stated that it was closely related to *D. schimperi*. Subsequently, however, we have become aware of the existence of intermediate specimens [Yemen. Hadhramaut, *Po-pov GPH610* (BM), 11 Dec. 1947, *Thesiger s.n.* (BM)], suggesting that *D. cinerea* should be considered a subspecies or variety of *D. schimperi*. We favor the subspecies option, since *D. schimperi* consistently exhibits a number of distinctive features (glabrous or glabrescent stems, leaves, and phyllaries; elliptic-lanceolate leaves with non-pustulate teeth; etc.) throughout its geographic range (Djibouti, Egypt, Sudan, Somalia, and the Arabian Peninsula). Individuals that deviate from this pattern are found only in two small areas, in the northeast of its range in the Horn of Africa (see Fig. 4), and in the region of Hadhramaut in Yemen. These two areas were contiguous until their separation at the end of the Miocene (Mattaue, 1967), by which time the Asteraceae were already fully differentiated (Graham, 1996). Individuals of *D. schimperi* from Hadhramaut are densely tomentose and have some ovate leaves, and appear to be intermediate between this taxon and *D. cinerea*. In our opinion, the treatment of *D. cinerea* at subspecies rank is justified purely by the geographic distribution of the two taxa. In addition, the specimens from northeastern Somalia that we described as *D. cinerea* are sharply defined by their densely tomentose stems, leaves, and phyllaries, and broadly ovate to sub-orbicular leaves with pustulate teeth.

KEY TO THE SUBSPECIES OF *DICOMA SCHIMPERI*

- 1a. Plants glabrous or glabrescent; leaves elliptic-lanceolate with non-pustulate teeth; apical mucro 0.3–0.5 × 0.2–0.3 mm *D. schimperi* subsp. *schimperi*
- 1b. Plants densely tomentose; leaves broadly ovate to suborbicular with pustulate teeth; apical mucro 0.5–1 × 0.3–1 mm *D. schimperi* subsp. *cinerea*

7a. *Dicoma schimperi* subsp. *schimperi*

Plant glabrous to glabrescent. Leaves (8)15–50 × (2)–5–13(–18) mm, elliptic-lanceolate; leaf margins serrulate, with non-pustulate teeth and an apical mucro 0.3–5 × 0.2–0.3 mm; both surfaces greenish, glabrous to glabrescent. Involucre with (40)–70–100 phyllaries, glabrous to glabrescent. Corolla 5.5–9 mm long. Achenes 1.8–2.5 × 1.2–1.8 mm; pappus of (5)9–10 bristles, 4–5 mm long.

Habitat and distribution (Fig. 4). In the Horn of Africa, known only from Djibouti (Audru et al., 1994) and the north of Somalia at 714–1000 m.

Principally in gypseous and limestone soils, stony or not; in *Acacia-Commiphora* bushland. Djibouti, Egypt, Sudan, Somalia, and the Arabian Peninsula.

Specimens examined. SOMALIA. Without exact locality: Goda, 1000 m, Chedeville 411 (FT), 518 (FT). Bari: 3 km below Galgallo on road to Boosaaso, Bally & Melville 15857 (K); Gardo, 9°32'N, 49°07'E, 714 m, Gillett 23405 (K). Togdheer: Wagga Mountain, 1897, Lort Phillips s.n. (BM, K).

7b. *Dicoma schimperi* subsp. *cinerea* (S. Ortiz & Rodr. Oubiña) S. Ortiz & Rodr. Oubiña, comb. nov. Basionym: *Dicoma cinerea* S. Ortiz & Rodr. Oubiña, Canad. J. Bot. 72: 1479. 1994. TYPE: Somalia. Sanaag: Einand, 11°02'N, 48°55'E, 2000 m, 21 Aug. 1957, *Newbould 1013* (holotype, K).

Plant densely tomentose. Leaves 5–10 × 6–16 mm, broadly ovate to suborbicular; leaf margins serrulate, with pustulate teeth and an apical mucro 0.5–1 × 0.3–1 mm; both surfaces grayish white, densely tomentose. Involucre with 40–60 phyllaries, densely tomentose. Corolla 7.5–7.7 mm long. Achenes 1.5–2.5 × 1–2 mm. Pappus of (4)–8–10(–11) bristles, 4–7 mm long.

Habitat and distribution (Fig. 4). Known only from the type locality in the north of Somalia at ca. 2000 m. Limestone scree and boulders. Endemic? There are morphologically intermediate specimens between this subspecies and subspecies *schimperi* in the Arabian Peninsula.

8. *Dicoma scoparia* Rodr. Oubiña & S. Ortiz, Bot. J. Linn. Soc. 119: 61. 1995. TYPE: Somalia. Mudug: Central Massif, about 18 km from the sea, 6°01'N, 48°47'E, 35 m, 27 May 1989, Gillett, Hemming & Watson 22175 (holotype, K).

Shrub to 25 cm high. Taproot slightly ramified. Stem highly ramified; the branches striate, with a grayish white tomentum of simple hairs, principally along the grooves. Leaves (0.8)–1.1–1.9(–3.1) × 0.5–0.9(–1) mm, sessile, deltoid to spatulate; the margins entire; apex acute; upper surface greenish, glabrous to tomentose; lower surface greenish, glabrous, with 3 conspicuous veins. Capitula numerous per plant, solitary or two on erect to erect-patent peduncles 6–50 mm long, with 1–2 subtending leaves; involucre 6.5–8 × (3.8)–4–4.5(–5.5) mm, narrowly cylindric, with 20–30 phyllaries arranged in 5–6 rows, stramineous, with a broad greenish stripe on either side of the midrib and brownish purple at the apex, rigid, acuminate, pungent, glabrous to scarcely tomentose, the margins entire to shortly

serrulate-fimbriate, principally toward the apical part, not scarious or with very narrow scarious margins; the outermost phyllaries 0.5–1.5 × 0.8–1.5 mm, broadly deltate, patent to erect-patent; middle phyllaries 3–4 × 1.3–1.5 mm, deltate-lanceolate, erect, with an acuminate-aristate apex 0.2–0.3(–0.5) mm long; innermost phyllaries 5–5.5(–6) × (1.3–) 1.5–1.7(–1.9) mm, longer than the outer phyllaries and 3–4(–5) mm shorter than the pappus, oblong-lanceolate, erect, with an acuminate-aristate apex 0.4–0.5(–0.6) mm long, the scarious margin 0–0.1 mm wide; receptacle concave, alveolate, the pits surrounded by a membrane with an irregular dentate margin 0.2–0.5 mm high. Florets 5–7 per capitulum. Corolla 6.5 × 1.5 mm, pale lilac to purple, with epidermal cell surface “intestine-like” and with short glandular twin hairs; tube 2.5–3 × 0.4–1 mm; lobes 3–3.8 × 0.5–0.6 mm, becoming recurved, with slender, submarginal veins. Stamens exerted for 1–1.5 mm beyond the corolla; filaments 2 mm long; collar 0.5–0.6 mm long; anthers 3.9–4.2 mm long; apical appendages ca. 1 mm long, conspicuously long apiculate; anther tails 1.3–1.5 mm long, with retrorse hairs 0.4–0.6 mm long and some shorter antorse hairs at the apex. Style 7–7.5 mm long, stylar branches 1–1.1(–1.2) mm long, with sweeping hairs forming a subapical ring, covering a surface 0.4 mm long, the basal ones slightly longer than the others. Achenes 3.5–3.7 × 1 mm, turbinate, 10-ribbed, hispid with ascending hairs (0.3)–0.4–2 mm long, these inserted between the ribs from the base to the top of the achene, with epidermal glands and superficial biseriate glands between the ribs; testa of *Dicoma* type; pappus isomorphic, of 65–75 barbellate bristles arranged in 3–4 series, the innermost bristles broadened toward the base, the longest bristles 6.5–7 mm long, the shortest bristles 0.3–0.5 mm long; barbellae 0.1–0.15 mm long.

Habitat and distribution (Fig. 5). Known only from the Mudug region near the sea at 35–200 m. Limestone; low grassy vegetation. Endemic.

Additional specimen examined. SOMALIA. Mudug: E of Gawen, ca. 3 km on road from Hobyto to Wisil, 150–200 m, Thulin & Abdi Dahir 6620 (K).

Dicoma scoparia is one of the most morphologically distinctive of all species of the genus. Important characters include the very small (generally less than 2 mm long), deltate to spatulate leaves with three longitudinal nerves, and the one or two long-pedunculate capitula with narrowly cylindrical involucre conspicuously overtopped (by (3)–4–5 mm) by the pappus. The achenes (3.5–3.7 × 1 mm) are turbinate, but considerably narrower than is

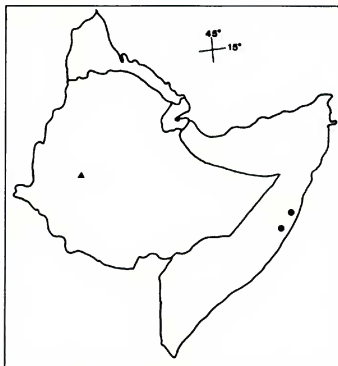


Figure 5. Distribution of *Dicoma scoparia* (●) and *D. sessiliflora* subsp. *stenophylla* (▲) in the Horn of Africa.

typical for the genus. No other species of *Dicoma* shows particular similarities with *D. scoparia*.

9. *Dicoma sessiliflora* Harv. subsp. *stenophylla*
G. V. Pope, Kew Bull. 46: 701. 1991. TYPE:
Nigeria. Lokoja, Mt. Patti, *Dalziel* 33 (holo-
type, K).

Perennial herb to 95 cm high, from woody root-stock. Stems annual, simple, solitary, with 4–6 sides in transverse section, covered with a tomentum of long, mixed, grayish white, simple hairs which form a sheath around the stem, with sessile to subsessile glands, often with glabrous to glabrescent areas. Leaves 110–130 × 15–37 mm, elliptic to oblanceolate, sessile to subsessile; the margins sparsely serrulate; apex acute to subobtusate; upper surface green, glabrous to glabrescent; lower surface with sessile to subsessile glands, densely grayish white-tomentose. Capitula solitary, terminal (in the sole specimen known from the Horn of Africa) or few per plant, sessile (in this specimen) or short-stalked, with 0–1 subtending leaf; involucre 33 × 33 mm, obconic-campanulate, with 100–120 phyllaries arranged in 10–12 rows, greenish-stramineous, rigid, acuminate, pungent, glabrous; the margins slightly revolute, entire to shortly serrulate principally toward the apical part, with an acuminate apex 1–1.5 mm long; outermost phyllaries 6.5–7 × 2.3–2.5 mm, deltate, patent to erect-patent, the margins not scarious; middle phyllaries 20–23 × 3–5 mm, lanceolate, erect to erect-patent, the scarious margin 0–1 mm wide; innermost phyl-

laries 18–20 × 4–5 mm, shorter than the adjacent outer phyllaries, as long as the pappus, lorate, erect, white scarious; longest phyllaries projected (3–)5–10(–15) mm beyond the pappus; receptacle concave, alveolate, the pits surrounded by a membrane with an irregular dentate-fimbriate margin 1–2 mm high. Florets 30–50(–65) per capitulum. Corolla 9.3–9.6 × 1.5–1.6 mm, yellowish, with epidermal cell surface slightly transversely undulate-striate to smooth and long glandular twin hairs; tube 3–4 × 0.6–1.2 mm; lobes 6 × 0.5–0.6 mm, straight, with thick marginal veins. Stamens little or not exerted; filaments 1.5–2.5 mm long; collar 1 mm long; anthers 8.5–9 mm long; apical appendages ca. 1.7–2 mm long, not apiculate; anther tails 4.5–4.6 mm long, with retrorse hairs 0.3–0.5 mm and without antrorse hairs at the apex. Style 9–9.1 mm long, stilar branches 2.2–3 mm long, with sweeping hairs forming a subapical ring, covering a surface 0.5 mm long, all the sweeping hairs of a similar length. Achenes (immature) 3 × 2–2.5 mm, obovoid, not conspicuously ribbed, hispid, with ascending hairs 0.3–4(–5) mm long, with a bulbous, glandular base, inserted all around the achene from its base to near its top; without epidermal glands and superficial biseriate glands; testa of *Gochnatia* type, with lateral and basal walls of the testa epidermis strengthened, u-shaped in cross section; pappus isomorphic, of 70–80(–90) plumose bristles arranged in 3–4 series, the longest bristles 9–10 mm long, the shortest 2–3 mm long; plumose barbellae 0.5–1 mm long.

Habitat and distribution (Fig. 5). Known from Ethiopia from only one locality, at 1500 m. Savanna. Senegal, Guinea Bissau, Ghana, Togo, Nigeria, Central African Republic (Pope, 1991), Sudan, Ethiopia, and Uganda.

Specimen examined. ETHIOPIA. **Welega:** Neki'mite, near bridge crossing Didessa river, 1500 m. *W. J. J. O. de Wilde* 8941 (K).

The principal diagnostic characters of *Dicoma sessiliflora* subsp. *stenophylla* include its elliptic to oblanceolate leaves, very large by comparison with those of other species of our area (110–130 × 15–37 mm), together with its very large involucre (33 × 33 mm in the single capitulum examined), phyllaries without a midrib, white, scarious innermost phyllaries shorter than the adjacent outer phyllaries, florets with straight corolla lobes, slightly transversely undulate-striate to smooth epidermal cell surfaces, long anthers (8.5–9 mm), anther tails without apical antrorse hairs, stilar sweeping hairs of uniform length, achenes not conspicuously ribbed, without epidermal glands or superficial bi-

seriate glands and with hairs with a bulbous, glandular base inserted all around the achene, *Goch-natia*-type testa, and pappus of plumose hairs. Most of these characters are shared with other species of section *Pterocoma*, all of which have very similar morphology; differentiation is largely on the basis of vegetative characters, particularly leaf morphology (see Pope, 1991). Of the taxa of this section, the most similar to *D. sessiliflora* subsp. *stenophylla* is obviously *D. sessiliflora* subsp. *sessiliflora*; however, this taxon has phyllaries with a conspicuously scarious border, while the outermost phyllaries are reflexed. *Dicoma elliptica* Pope is very close to *D. sessiliflora*, and can be differentiated from *D. sessiliflora* subsp. *stenophylla* by the same characters that distinguish subspecies *stenophylla*; in addition, its leaves are generally linear-elliptic and subcoriaceous with a conspicuously revolute margin (see Pope, 1991).

We know of only one sheet of *Dicoma sessiliflora* subsp. *stenophylla* from Ethiopia, though one of us (Mesfin Tadesse) considers that it is probably not uncommon there. Pope (1991) did not cite this subspecies from Sudan, Ethiopia, or Uganda.

The single Ethiopian specimen has only one capitulum and this is immature, so it was not possible to assess the relative length of the pappus ensemble, the shape of the receptacle pits, the number of florets per capitulum, etc., without damaging the specimen. These data were thus evaluated from specimens from other countries.

10. *Dicoma somalensis* S. Moore, J. Bot. 37: 60. 1899. TYPE: Somalia. Togdheer: Wagga Mountain, above Upper Shiiikh, 6000 ft., 1 Feb. 1897, *Lort Phillips s.n.* (holotype, BM; isotype, K). Figure 6.

Vernacular names. Adah (Gillett 4002), Gundre (Godding 87), Ma-adadi (Gillett 4620, Cufodontis (1967)), Bastireh (Drake-Brockmann s.n.).

Shrub 50 cm high, highly ramified; the branches striate, glabrescent or covered with a grayish white tomentum of simple hairs, with sessile to subsessile glands. Leaves (3)–8–20(–30) × (0.8)–1–1.5(–2.5) mm, linear to linear-oblongate, attenuate at base and decurrent on a pseudopetiole 0–2(–3) mm long; the margins somewhat revolute, scarcely serrulate to the apical part; apex mucronate; upper surface green, glabrescent to tomentose, rugose, with sessile glands; lower surface generally densely grayish white-tomentose, without sessile glands. Capitula numerous per plant, on peduncles erect to erect-patent, 2–10 cm long, normally without subtending leaves; involucre 5–13 × (10)–15–20 mm, broadly

campanulate, with (100)–120–140 phyllaries, these mainly squarrose, arranged in 6–8(–10) rows, stramineous, with a darker stripe on either side of the midrib, acuminate-pungent, glabrous, minutely strigose, the margins entire to shortly ciliate or fimbriate principally toward the apical part; outermost phyllaries 1.5–2 × 1 mm, deltate, patent to erect-patent, with an acuminate apex ca. 1 mm long, the margins not scarious; middle phyllaries 5–7 × 1.5–2 mm, oblong-lanceolate, squarrose, with an acuminate apex 2–2.5 mm long, the scarious margin 0.2–0.3(0.5) mm wide; innermost phyllaries (7)–8–10(–13) × 1.5–2 mm, linear-lanceolate, erect, longer than the outer phyllaries and projected (0)–1–2 mm beyond the pappus, with an acuminate-aristate apex 0.5–2 mm long, the scarious margin 0.3–0.5 mm wide; receptacle flat, very slightly alveolate, pits surrounded by a membrane 0–0.15 mm high. Florets (13)–16–20 per capitulum. Corolla 7–8 × 1.5 mm, white to purplish white, with epidermal cell surface “intestine-like” and with short glandular twin hairs; tube 4–5 × 0.5–0.6 mm; lobes 3–3.5(–4) × 0.5–0.7 mm, becoming recurved, with slender submarginal vein. Stamens exerted for 1–2.5 mm beyond the corolla; filaments 1.7–1.8 mm long; collar 0.6–0.8 mm long; anthers 5.5–7 mm long; apical appendages ca. 1.2 mm long, narrowly apiculate; anther tails ca. 2 mm long, with retrorse hairs 0.1–0.2 mm long and some shorter antrorse hairs at the apex. Style 9–10 mm long, stylar branches 2–3 mm long, with sweeping hairs forming a subapical ring, covering a surface 0.3–0.5 mm long, all hairs of similar length or the basal ones longer than the others. Achenes 1.5–2 × 1–1.3 mm, turbinate, (8)–10-ribbed, hispid, with ascending hairs 0.3–2.5 mm long, these inserted between the ribs on the inferior third of the achene, with epidermal glands and superficial biserial glands between the ribs; testa of *Dicoma* type; pappus isomorphic, of 100–130 barbellate bristles arranged in 4–5 series, the innermost bristles broadened toward the base, the longest bristles 7–8(–9) mm long, the shortest 1 mm long; barbellae 0.1–0.2 mm long.

Habitat and distribution (Fig. 7). Known only from northwestern Somalia at 1250–1868 m. Principally on rocky slopes in limestone areas. Endemic.

Additional specimens examined. SOMALIA. Without exact locality: 26 Feb. 1913, *Drake-Brockmann s.n.* (K); Golis Range, *Drake-Brockmann 164* (K). **Sanaag:** 10°11'N, 47°28'E, 1300 m, *Gillett & Watson 23761* (K); Medishe Valley (Midhisho?), *Glover & Gilliland 942* (BM, K). **Togdheer:** 9°57'N, 45°61'E, 1460 m, *Gillett & Watson 23616* (K); Upper Shiiikh, 4900 ft., *Godman 75* (BM);

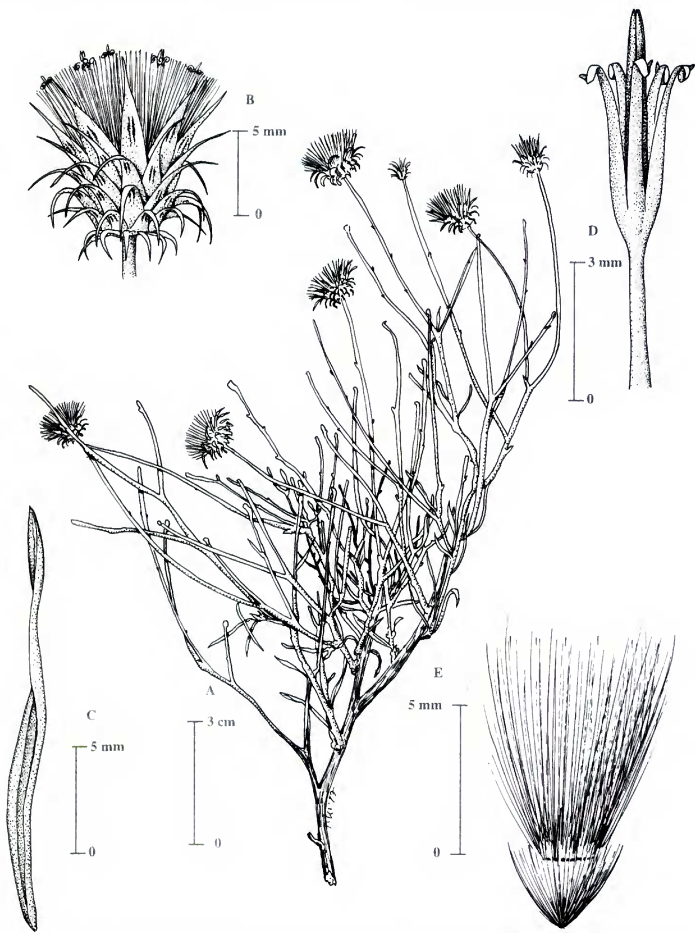


Figure 6. *Dicoma somalensis* (Gillett 4620 (K)). —A. Habit. —B. Capitulum. —C. Leaf. —D. Floret. —E. Achene with pappus.

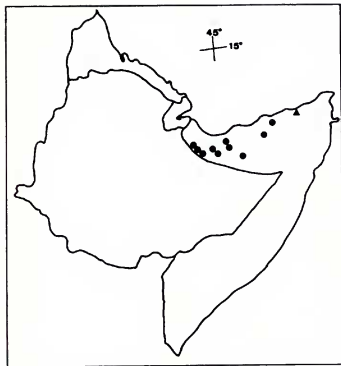


Figure 7. Distribution of *Dicoma somalensis* (●) and *D. thuliniana* (▲) in the Horn of Africa.

Shiikh, 4500 ft., *Ironside Wood S/73/2* (K). **Woqooyi Galbeed:** Abassa, on road from Boorama to Djibouti, 4900 ft., *Bally B9967* (K); Hargeysa, 9°33'N, 44°0'E, 4300 ft., *Gillet 4002* (K); Andoba, 10°6'N, 43°0'E, 5400 ft., *Gillet 4620* (FT, K); 35 km NW of Hargeysa, 9°41'N, 44°19'E, 1250 m, *Gillet 22845* (K); Dardode, 10°07'N, 2°58'E, 1868 m, *Goddard 87* (K).

The principal diagnostic characters of *Dicoma somalensis* are its linear to linear-oblong leaves, involucre with numerous (100–)120–140), glabrous, mainly squarrose phyllaries arranged in 6–8(–10) rows, and pappus of 100–130 barbellate bristles 7–9 mm long. The most morphologically similar species in the Horn of Africa is *D. hindiana*; indeed, as mentioned above, all specimens of *D. hindiana* at K had been labeled as *D. somalensis*. However, there are marked morphological differences between the two species: *D. hindiana* has fewer phyllaries per capitulum (35–70); these are pubescent, and the innermost are squarrose. In addition, *D. hindiana* has a shorter corolla (ca. 5 mm), longer (2.7–3 mm), narrowly turbinate achenes, and fewer (60–70) and shorter (4.5–5.2 mm) pappus bristles. Outside the Horn of Africa, the only species with clearly squarrose phyllaries (like *D. somalensis* and *D. hindiana*) is the Angolan endemic *D. squarrosa*; as noted for *D. hindiana*, however, *D. squarrosa* shows a number of clear differences.

Cufodontis (1967) cited *D. somalensis* from Ethiopia, but we have not seen any specimens from that country.

11. *Dicoma thuliniana* S. Ortiz, Rodr. Oubiña & Mesfin, sp. nov. TYPE: Somalia. Bari: 20 km from Dhurbo on road toward El Gal, 11°33'N, 50°19'E, 900 m, 22 Nov. 1986, *Thulin & Warfa 5975* (holotype, UPS). Figure 8.

Differt a simili *Dicoma paiva* caulibus erectis, foliis rectis atque (5–)15–22(–26) mm longis, bracteis involucralibus longis acuminatis, acumine (1.2–)1.5–3.5 mm longo, atque pappo 6–7 mm longo.

Shrub to 20 cm high, ramified; the branches striate, covered with a dense grayish white tomentum of simple hairs, with sessile to subsessile glands. Leaves sessile, (5–)15–22(–26) × 7–10 (–12) mm, linear; the margins revolute, entire; apex with a short spine 0.2–1(–1.2) mm long; both surfaces densely grayish white-tomentose, with sessile to subsessile glands. Capitula numerous per plant, solitary, on leafy, erect to erect-patent peduncles, 20–50 mm long, with (0–)1–3 subtending leaves; involucre 10–11 × 11–12 mm, campanulate, with 40–50 phyllaries arranged in 5–6 rows, stramineous, with a darker stripe on either side of the midrib, long acuminate-aristate, pungent, tomentose, the margins entire to shortly serrulate principally toward the apical part, not scarious; outermost phyllaries 2–2.5 × 0.8–1.2 mm, deltate-oblong, erect-patent, with an acuminate apex 1.2–2 mm long; middle phyllaries 3–6 × 0.8–1.2(–1.5) mm, ovate-lanceolate, erect-patent, with an acuminate-aristate apex 1.5–3 mm long; innermost phyllaries 6–8 × 1.5–3 mm, longer than the outer phyllaries and projected 1.5–2 mm beyond the pappus, oblong-lanceolate, erect-patent, with an acuminate-aristate apex 2.5–3.5 mm long. Florets unknown. Achenes (2–)3–3.5 × 1.5–2 mm, turbinate, 10-ribbed, hispid, with ascending hairs 0.3–2.5(–3) mm long, inserted between the ribs from the base to the top of the achene, with epidermal glands and superficial biseriate glands between the ribs; testa of *Dicoma* type; pappus isomorphic, of 100–130 barbellate bristles arranged in (4–)5–6 series, the innermost bristles broadened toward base, ca. 0.4 mm wide, the longest bristles 6–7 mm long, the shortest ca. 1 mm long, barbellae 0.05–0.15 mm long.

Habitat and distribution (Fig. 7). Known only from the type locality, at ca. 900 m. South-facing limestone slopes; vegetation of sparse low bushes. Endemic.

The most distinctive characters of *Dicoma thuliniana* are its solitary, linear leaves with revolute margins and short, apical spine, capitula on leafy, erect to erect-patent, peduncles 20–50 mm long, large (10–11 × 11–12 mm) campanulate involucre

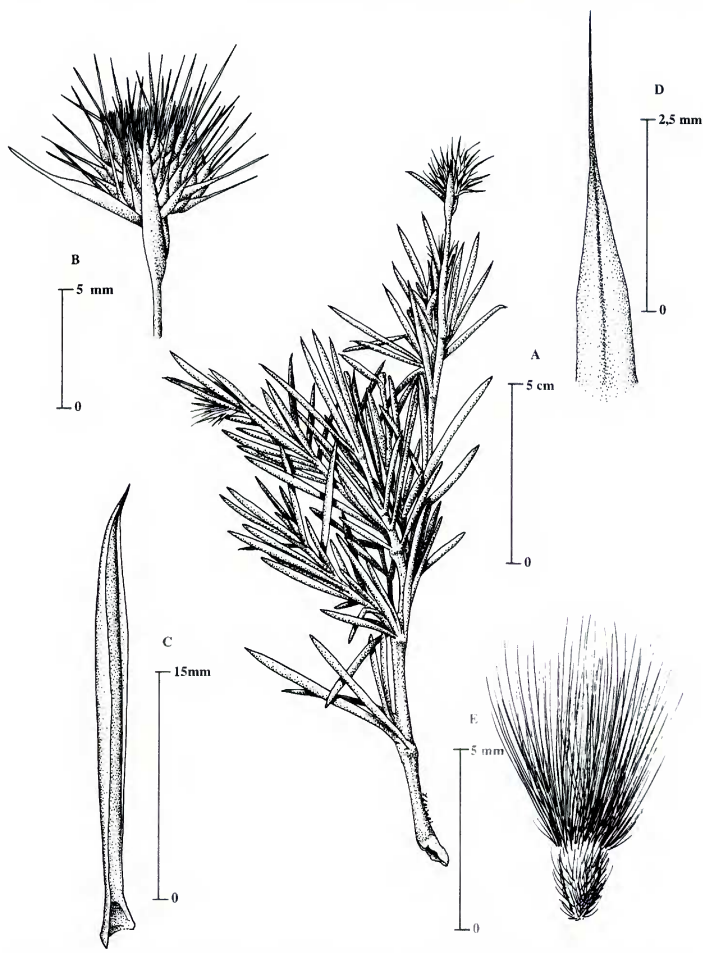


Figure 8. *Dicoma thuliniana* (Thulin & Warfa 5975 (UPS)). —A. Habit. —B. Capitulum. —C. Leaf. —D. Phyllary apex. —E. Achene with pappus.

with 40–50 phyllaries, and deltate to oblong-lanceolate phyllaries with an acuminate-aristate apex 1.2–3.5 mm long. The most morphologically similar species in the Horn of Africa is *D. paivae*, which can be readily distinguished by its twisted branches forming dense whitish cushions, slightly recurved and often subfasciculate leaves, sessile or subsessile capitula, obconic-campanulate involucre (6–6.5 × 3–4 mm), 25–30 deltate to deltate-lanceolate phyllaries with pungent, acuminate apices 0.2–1 mm long (this feature being particularly distinctive), and shorter pappus (3–5 mm). Of the species of *Dicoma* from outside our area, *D. cana* Balf. f., from Socotra, has leaves showing certain morphological similarities, though in other respects exhibits clear differences (mostly similar to those observed between *D. cana* and *D. paivae*). Furthermore, *D. thuliniana* does not appear to form the dense cushions characteristic of *D. paivae* and *D. cana*.

This species is named after Mats Thulin (UPS), one of the collectors of the type, one of the most knowledgeable experts on the Somali flora, and editor/author of the *Flora of Somalia*.

12. *Dicoma tomentosa* Cass., Bull. Sci. Soc. Philom. Paris. 1818: 47. 1818. TYPE: Senegal, *Adanson s.n.* (holotype, P).

Dicoma lanuginosa DC., Prodr. 7: 36. 1838. TYPE: "Eastern India," Wallich s.n. (lectotype, here designated, G).

Dicoma gnaphaloides Mattei, Boll. Reale Orto Bot. Palermo 7: 112. 1908. TYPE: Somalia. Goscia, Torda, 21 Aug. 1907, *Macaluso 96* (holotype, PAL).

Vernacular names. Bisciar (Cufodontis, 1967), Gaicou (Cufodontis, 1967), Tebe-mro (*Mateos Er. 68*), Yset-melase (*Soda Ash Project 2*).

Annual herb to 60 cm high. Taproot slender, lightly ramified. Stem scarcely to highly ramified; the branches striate, generally reddish purple, covered with a grayish white tomentum of simple hairs, with sessile to subsessile glands, often with glabrous to glabrescent areas. Leaves (10–)20–50(–80) × (2–)4–10(–16) mm, linear to linear-oblongate, rarely linear-elliptic, conduplicate, attenuate at base and decurrent on a pseudopetiole 0–5 mm long; the margins callose-serrulate; apex 0.5–1.5 mm long, apiculate to aristate with a short spine; upper surface greenish, glabrescent, with sessile glands; lower surface with sessile glands, generally densely grayish-white-tomentose, rarely greenish and glabrescent. Capitula numerous per plant, generally solitary in leaf axils, with 1(–4) subtending leaves, sessile or on peduncles, erect-patent, 1–5 (–8) mm long; involucre (11–)12–15(–17.5) × (10–)

12–20(–25) mm, obconic-campanulate, with 30–45(–50) phyllaries arranged in 5–6 rows, stramineous to purple, with a darker stripe on either side of the midrib, rigid, long-acuminate, pungent, glabrescent to densely tomentose, minutely strigose, the margins entire to shortly serrulate-ciliate, principally toward the apical part; outermost phyllaries 2–4.5 × (0.5–)0.7(–1) mm, deltate to ovate-oblong, patent to erect-patent, with an acuminate apex 1–3.5 mm long, the margins not scarious; middle phyllaries 9–17 × 1.5–2.5 mm, oblong-lanceolate, erect-patent, with an acuminate-aristate apex 4–7 mm long, the scarious margin 0.2–0.3(–0.5) mm wide; innermost phyllaries 11–14 × 2–3 mm, generally of similar length to or shorter than the adjacent outer phyllaries and projected 2–5(–6) mm beyond the pappus, oblong-lanceolate, erect, with an acuminate-aristate apex 2–5 mm long, the scarious margin up to 0.5 mm wide; receptacle concave, alveolate, the pits surrounded by a membrane with a highly irregular dentate margin 0.7 mm high. Florets (7–)10–12(–15) per capitulum. Corolla 6.5–7 × 1.5–2 mm, white, lilac, or violet, with epidermal cell surface "intestine-like" and with short glandular twin hairs; tube 3.4–3.7 × 0.7–1 mm; lobes 3–3.7 × 0.3–0.5 mm, becoming recurved, with slender submarginal veins. Stamens exerted for 0.2–1.5 mm beyond the corolla; filaments 1.7–2 mm long; collar 0.6–0.7 mm long; anthers 3–3.8 mm long; apical appendages ca. 1.2–1.3 mm long, not conspicuously apiculate; anther tails 1–1.3 mm long, with retrorse hairs 0.2–0.5 mm long and some shorter antrorse hairs at the apex. Style 7.5–8 mm long, stylar branches 1–1.5 mm long, with sweeping hairs covering a surface 0.5–0.8 mm long, the basal ones conspicuously longer than the others. Achenes 1.6–3 × 1–1.5 mm, turbinate, (8–)10-ribbed, hispid, with ascending hairs 0.3–2.5 mm long, these inserted between the ribs from the base to the top of the achene, with epidermal glands and superficial biseriate glands between the ribs; testa of *Dicoma* type; pappus dimorphic, of 50–80 barbellate bristles arranged in 1–3 external series, the innermost bristles broadened toward the base, the longest bristles 5–6(–7.5) mm long; the shortest 2 mm long; barbellae 0.1–0.2 mm long; ca. 10 scales arranged in a single internal series, these (5–)6–6.5 (–7.5) × 0.5–1 mm, barbellate toward the apex.

Habitat and distribution (Fig. 9). Widespread in Eritrea, Ethiopia, and Somalia at 230–1700 m. Sandy, gravelly, and rocky granitic or calcareous soils, lava flows; in open *Acacia* woodland, *Acacia-Commiphora* bushland, *Acacia* grassland, open habitats, roadsides. Widespread in north Africa

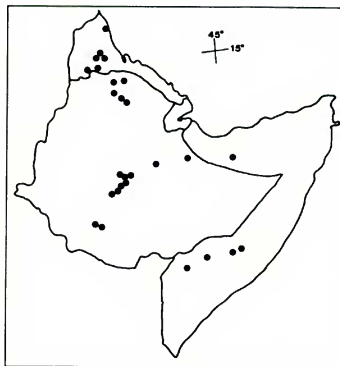


Figure 9. Distribution of *Dicoma tomentosa* in the Horn of Africa.

(Egypt) and tropical and southern Africa; also in Socotra, Pakistan, and India.

Additional specimens examined. ERITREA. Between Galeb Zagle and Malekte, 17°7'N, 38°45'E, 850 ft., *Bally 6786* (ETH, K); Cheren, Do-Longoroc, *Gandussio 79* (FT); Bogos, Moccada, *Pappi 2484* (FT, K); Bogos, Tzabab, *Pappi 8468* (FT); Keren, 10–25 Nov. 1902, *Tellini s.n.* (FT); Keren, *Tellini 781* (FT). ETHIOPIA. Without exact locality: 1853, *Schimper 426* (G, K, P, W). **Gamo Gofa:** without exact locality, 610 m, *Sebbe & Amha 653* (ETH); Nechar National Park, Arba Minch, *Mateos Er. 68* (ETH); between Lake Ch'amo and Lake Abaya, 6°30'N, 37°38'E, 1250–1300 m, *Gilbert, Thulin & Aweke 295* (ETH, K, UPS); **Harerge:** Errer Valley, 4 km E of the river, 9°14'N, 42°15'E, 1300 m, *Burger 3566* (K); about 30 km N of bridge crossing Awash River along road to Gewane, 800 m, *Seegeler 2794* (ETH). **Shewa:** Sodere, 8°25'N, 39°24'E, N bank of Awash River, ca. 28 km S of Nazareth, *Ash 2106* (K); Erer, *IECAMA H-9* (K); Gala Aruss, 1009, *Negri 911* (FT); Awash National Park, 950 m, *Nystrom 77* (ETH); 1 km W of Birra, on track to Koye, ca. 10 km from Meki, 8°14'N, 38°55'E, 1700 m, *Gilbert & Gelahun Abate 3121* (ETH, K); Awash National Park, 8°55'N, 39°55'E, *Gilbert & Gilbert 1256a* (ETH, K); 1–2 km W of Metahara, 8°55'N, 39°54'E, 1050 m, *Gilbert & Thulin 219* (ETH, UPS); Abyjatta, 1650 m, *Soda Ash Project 2* (ETH). **Sidamo:** near Murle Lake, *Corradi 1762* (FT); Atana-Murle road, *Corradi 1814* (FT). **Tigray:** Haramat, Cianduch Plain, *Pappi 226* (FT); "ad montes prope Dscheladscheramme," Tekeze Valley, 3 Nov. 1839, *Schimper s.n.* (G, K, OXF, P, Pl, S, W); "in montibus prope Gageros," Agow, 3500 ft., 18 Oct. 1854, *Schimper s.n.* (G, K, P, S, W); Temben Awarja, 11.7 km along Yechila–Abiy Adi road, 1500 m, *Mesfin T. 8551* (ETH); Yechila, ca. 94 km from Mek'ele, 1600 m, *Mesfin T. & Teuolde 8520* (ETH). **SOMALIA.** Bay: Baydhabo, 2°59'N, 44°16'E, 230 m, *Thulin & Bashir Mohamed 7105* (K, UPS). **Gedo:** 20 km along road between Garbahaarrey and Qansaxdeheere, 300 m,

Thulin & Bashir Mohamed 6917 (UPS); 5 km along road between Garbahaarrey and Luuq, 250 m, *Thulin & Bashir Mohamed 6924* (K, UPS). **Hiiraan:** 5.5 km S of Dharyo on road to Gobyaxas, 3°37'N, 44°54'E, 275 m, *Kuchar 17329* (K, UPS). **Togdheer:** 8°50'N, 45°34'E, 870 m, *Beckett 1361* (K); Buulobarde, ½ km SW of Aborey, 4°0'N, 45°41'E, 195 m, *Kuchar 17601* (K).

The principal diagnostic characters of *Dicoma tomentosa* are its linear-elliptic to linear-oblancoate often conduplicate leaves, apically apiculate to aristate with a short spine, its sessile or short-pedunculate, generally solitary axillary capitula with obconic-campanulate involucre, deltate to oblong-lanceolate phyllaries with long (1–7 mm) pungent acuminate-aristate apices, style with sweeping hairs covering a surface 0.5–0.8 mm long, and dimorphic pappus of 50–80 barbellate bristles and ca. 10 scales arranged in a single internal series. Of the *Dicoma* species in the Horn of Africa, only *D. bangueolensis* has a dimorphic pappus of similar composition; as noted elsewhere, however, that species shows marked differences as regards habit, leaf morphology, and the morphology and size of the phyllaries and achenes. A number of other species, including *D. cana* and *D. spinosa* (L.) Druce, and to a lesser extent *D. latifolia* DC. and *D. rehmanoides* Less., have phyllaries with a long-pungent, acuminate apex; however, all of these are shrubs, and in addition present other clear differences from *D. tomentosa*, including the absence of a phyllary midrib, straight corolla lobes, achenes without prominent ribs and without epidermal glands or superficial biseriate glands between the ribs, and an isomorphic pappus.

Within the study area, *Dicoma tomentosa* shows relatively little morphological variability, though some variation is observed in growth habit (more or less prostrate), degree of ramification, pubescence and coloration of the stems and phyllaries (which may in some cases be purplish), leaf width, and length of peduncles, and number of capitula.

The type of *Dicoma gnaphaloides* Mattei, a name accepted by both Wilson (1923) and Cufodontis (1967), is indistinguishable from *D. tomentosa*, and we thus include the former name here as a synonym.

Literature Cited

- Anderson, L. E. 1954. Hoyer's solution as a rapid permanent mounting medium for bryophytes. *Bryologist* 57: 242–247.
Audru, J., J. C. Lebrun & P. Lebrun. 1994. Les Plantes Vasculaires de la République de Djibouti. Flore Illustrée. CIRAD, Paris.
Bremer, K. 1994. Asteraceae, Cladistics & Classification. Timber Press, Portland, Oregon.
Buscalioni, L. & R. Muschler. 1913. Beschreibung der

- von Ihrer Königlichen Hoheit der Herzogin Helena von Aosta in Zentral-Afrika gesammelten neuen Arten. Bot. Jahrb. Syst. 49: 457–515.
- Cabrera, A. L. 1977. Mutisieae—Systematic review. Pp. 1039–1066 in V. H. Heywood, J.-B. Harborne & B. L. Turner (editors), *The Biology and Chemistry of the Compositae*. II. Academic Press, London.
- Cufodontis, G. 1967. Enumeratio plantarum Aethiopae Spermatophyta (sequentia). Bull. Jard. Bot. Natl. Belgique 37, Suppl.: 115–1193.
- Davies, R. A. (editor). 1996. Index Kewensis, suppl. 20. Royal Botanic Gardens, Kew.
- Edwards, S., Mesfin T. & I. Hedberg (editors). 1995. *Flora of Ethiopia and Eritrea*, Vol. 2(2). The National Herbarium of the Addis Ababa University and the Department of Systematic Botany of the Uppsala University, Addis Ababa and Uppsala.
- Graham, A. 1996. A contribution to the geologic history of the Compositae, Pp. 123–140 in D. J. N. Hind & H. J. Beentje (editors), *Compositae: Systematics*. Proceedings of the International Compositae Conference, Kew. Royal Botanic Gardens, Kew.
- Grau, J. 1980. Die Testa der Mutisieae und ihre systematische Bedeutung. Mitt. Bot. Staatssaml. München 16: 269–332.
- Hansen, H. V. 1991. Phylogenetic studies in Compositae tribe Mutisieae. Opera Bot. 109: 1–50.
- Hedberg, I. & S. Edwards (editors). 1989. *Flora of Ethiopia*, Vol. 3. The National Herbarium of the Addis Ababa University and the Department of Systematic Botany of the Uppsala University, Addis Ababa and Uppsala.
- Hoffmann, O. 1893. Tubiflorae—Mutisieae. In: H. G. A. Engler & K. A. E. Prantl, *Die natürlichen Pflanzenfamilien* 4(5): 333–350. W. Engelmann, Leipzig.
- Jeffrey, C. 1967. Notes on Compositae: 2. The Mutisieae in East Tropical Africa. Kew Bull. 21: 177–223.
- Karis, P. O., M. Källersjö & K. Bremer. 1992. Phylogenetic analysis of the Cichorioideae (Asteraceae), with emphasis on the Mutisieae. Ann. Missouri Bot. Gard. 79: 416–427.
- Mattauer, M. 1967. Les déformations de matériaux de l'écorce terrestre. Herman Editeurs des Sciences et des Arts, Paris.
- Ortiz, S. & J. Rodríguez-Oubiña. 1994. *Dicoma paiva* and *Dicoma cinerea* (Asteraceae), two new species from Somalia. Canad. J. Bot. 72: 1478–1481.
- & ———. 1995. *Dicoma hindana* (Asteraceae), a new species from Somalia. Nordic J. Bot. 15: 187–189.
- & ———. 1996a. The identity of *Dicoma bangueolensis* (Asteraceae). Taxon 45: 519–520.
- & ———. 1996b. Two new species of *Dicoma* (Asteraceae) from Somalia and Ethiopia. Nordic J. Bot. 16: 277–281.
- Pope, G. V. 1991. Notes on *Dicoma* Cass. (Compositae). Kew Bull. 46: 699–709.
- Rodríguez-Oubiña, J. & S. Ortiz. 1995. Two new species of the genus *Dicoma* (Asteraceae) from Somalia. Bot. J. Linn. Soc. 119: 59–64.
- Thulin, M. (editor). 1993. *Flora of Somalia*, Vol. 3. Royal Botanic Gardens, Kew.
- Volkens, G. L. A. 1915. Berichtigungen zu den von R. Muschler in Engl. Bot. Jahrb. XLIII. (1909), XLVI (1911), XLIX (1913) und L. Suppl. (1914) veröffentlichten Diagnosen afrikanischer Pflanzen. II. Die "von Ihrer Königlichen Hoheit der Herzogin Helena von Aosta in Zentral-Afrika gesammelten neuen Arten." Compositae. Bot. Jahrb. Syst. 53: 373–375.
- Wilson, F. C. 1923. Revision of the genus *Dicoma*. Bull. Misc. Inform. Kew 1923: 377–388.